

Marked-Up Version of Amended Claims 1, 4, 13, 15 and 18

1 (Amended). A gas sensor comprising:

an optical source for emitting radiation therefrom;

a detector sensitive to radiation emitted from the source;

an optical pathway extending between the source and the detector;

a [circumferential] chamber[,] having optically reflective surfaces[, extending between the source and the detector] defining a substantially circular portion of the optical pathway and a substantially radial portion of the optical pathway; and

at least one reflector oriented generally at an oblique angle to the substantially circular portion of the optical pathway to separate the substantially circular portion of the optical pathway and the substantially radial portion of the optical pathway.

4 (Amended). The gas sensor of claim 3 further including a second end wall, extending generally radially between the outer and inner circumferential walls and at an oblique angle to a tangent of the outer or inner circumferential walls, to form the at least one reflector to reflect light through a gap in the inner circumferential wall into a central chamber [, the optical pathway between source and detector thereby comprising a substantially circumferential portion and a radial portion].

13 (Amended). The gas sensor of claim 12 in which the gas permeable member comprises a disc [of] having a radius greater than a radius of said inner circumferential wall and less than a radius of said outer circumferential wall.

15 (Amended). A gas sensor comprising:

an optical source for emitting radiation therefrom;

a detector sensitive to radiation emitted from the source;

a chamber, extending between the source and the detector, defined by a plurality of non-focusing, planar surfaces disposed to form a folded optical pathway that includes a plurality of segments substantially parallel to one another, each segment having at least one planar mirror surface adapted to reflect radiation to an adjacent segment at an approximately right angle.

18 (Amended). A method of forming a gas sensor comprising the steps of

providing an optical source for emitting radiation therefrom,

providing [and] a detector sensitive to radiation emitted from the source [at opposite ends of a circumferential chamber extending around the periphery of a sensor housing and having optically reflective surfaces along the length thereof],

providing an optical pathway extending between the source and the detector,

providing a chamber having optically reflective surfaces defining a substantially circular

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portion of the optical pathway and a substantially radial portion of the optical pathway; and
providing at least one reflector oriented generally at an oblique angle to the substantially
circular portion of the optical pathway to separate the substantially circular portion of the optical
pathway and the substantially radial portion of the optical pathway.

REMARKS

Applicant notes the acknowledgment of the claim for foreign priority. A certified copy of the priority document (UK 0103089.9) is submitted herewith.

The disclosure is objected to because of informalities. A substitute specification is submitted herewith in clean form (Attachment A) as well as in marked-up form (Attachment B) to overcome this objection. The substitute specification amends the specification by adding section headings. The substitute specification further amends the summary of the invention to more clearly reflect the subject matter being claimed. The substitute specification contains no new matter.

Claim 19 has been canceled.

Claims 1, 4, 13, 15 and 18 have been amended. In compliance with 37 C.F.R. §121(c)(3), a clean version of the entire set of pending claims is being submitted, as is a marked-up version showing changes in the amended claims relative to the previous version of the claims.

New claims 20-30 are presented for prosecution.

Claims 1-18 and 20-30 remain in the application. Of these, claims 1, 15, 23, 27 and 30 are independent apparatus claims and claim 18 is an independent method claim.

Claims 1-3, 6, 7, 10, 12 and 18 stand rejected in various combinations under 37 U.S.C. §102(b) based upon Ito U.S. Patent 4,700,079 (Ito '079) and under 37 U.S.C. §103(a) based upon Ito '079 in various combinations with Russell et al. U.S. Patent 4,810,096 (Russell '096) and Wong U.S. Patent 5,060,508 (Wong '508). None of the cited references, alone or in combination, teach or suggest a chamber having optically reflective surfaces defining a substantially circular portion of the optical pathway and a substantially radial portion of the optical pathway, as defined by amended independent claims 1 and 18 and associated dependent claims. Further, the cited references, alone or in combination, do not teach or suggest a reflector oriented generally at an oblique angle to the substantially circular portion of the optical pathway to separate the substantially circular portion of the optical pathway and the substantially radial portion of the optical pathway, as also defined by amended independent claims 1 and 18 and associated dependent claims.

Claims 15 and 16 stand rejected under 35 U.S.C. §102(b) based upon Wong '508. Claim 17 is rejected under 35 U.S.C. §103(a) based upon Wong '508 in view of Crowder U.S. Patent 4,560,875 (Crowder '875). Neither of the cited references, alone or in combination, teach or suggest an apparatus having a plurality of segments substantially parallel to one another, each segment having at least one planar mirror surface adapted to reflect radiation to an adjacent segment at an approximately right angle, as defined by amended independent claim 15 and its associated dependent claims.

New dependent claims 20-22 have been added to more particularly define the subject

matter being claimed.

New claim 30 incorporates the subject matter of claims 1, 2, 10 and 11 as filed. Claim 11 stands rejected under 35 U.S.C. §103(a) based upon Ito '079 in view of Wong '508 and further in view of Crowder '875. Applicant respectfully traverses this rejection. Crowder '875 only discloses a housing that is constructed sufficiently robustly to comply with flame and explosion proof safety standards (see Col. 6, lines 42-56). The solution suggested by Crowder '875 is to provide hermetic isolation of the source 8 and the detector 10 from any hazardous gas environment by providing an optical window 5 such that the optical pathway from and to the source and detector emerges from the hermetically sealed enclosure 1 and into the gas sampling volume defined by the hollow cage 12 perforated with apertures 13. Thus, the solution offered by Crowder '875 is to provide a hermetically sealed environment for the source and the detector, and to allow the optical beam to emerge therefrom, not to provide a flame arresting member that protects the optical pathway, source and detector, as defined by new independent claim 30.

Claim 13 has been amended to overcome an objection to informalities.

Claims 4, 5, 8, 9, 13 and 14 are objected to as being dependent on a rejected base claim. New claims 23-29 have been added in view of this indication of allowability as follows:

1. Claim 23 incorporates the subject matter of claims 1, 2, 3 and 4 as filed.
2. Claim 24 incorporates the subject matter of claim 5.
3. Claim 25 incorporates the subject matter of claim 8.
4. Claim 26 incorporates the subject matter of claim 9.
5. Claim 27 incorporates the subject matter of claim 14.
6. Claim 28 incorporates the subject matter of claims 1, 2, 10, 12 and 13 as filed.
Claim 28 also rephrases the subject matter of claim 13 to overcome the Examiner's objection to informalities in claim 13 as filed.
7. Claim 29 incorporates the subject matter of claim 11.

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Allowance of claims 1-18 and 20-30 is respectfully requested.

Respectfully submitted,

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